

Phase equilibria of ternary mixed hydrate system consisting of CH₄/N₂/CO₂

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The swapping phenomenon is one of the methane production methods that can produce methane and can sequester carbon dioxide at the same time by exchanging carbon dioxide molecules with methane molecules in the hydrate structure. When we inject N₂/CO₂ mixed gas in methane hydrate deposits, the methane swapping ratio shows higher value than when we inject only CO₂ gas. Phase equilibria of ternary mixed hydrate system consisting of CH₄/N₂/CO₂ is necessary to apply the swapping phenomenon to real gas hydrate deposits. Therefore, in this study, phase equilibrium data of CH₄/N₂/CO₂ mixed hydrates are measured depending on various CH₄ : N₂ : CO₂ ratio. The fractional experimental pressure differences ($\frac{P}{P}$) are also calculated and the values range from - 0.02 to - 0.10 in case of ternary mixed hydrates with calculated data by using CSMGem. These results can be utilized to forecast the behavior of CH₄/N₂/CO₂ ternary mixed hydrates after applying the swapping phenomena in the methane hydrate deposits.